Stock market driven acquisitions versus the Q theory of takeovers – The UK evidence

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Abstract

Using a sample of UK mergers and acquisitions from 1985-2004, we show that equity over-valuation appears to play an important role in the determination of financing method. Our results are broadly consistent with those theories based upon market over-valuation driving mergers and their financing, rather than a Q-theory explanation. In some contrast to the US results of Dong et al (2006) we find that proxies for over-valuation appear to be the more persuasive explanation for acquisition financing behaviour in the UK. Given the evidence in favour of valuation effects, we argue that a treatment effects model is necessary in investigating the long run performance of acquirers. Taken together with results from a univariate analysis, such a model reveals some modest support for the Shleifer and Vishny (2003) hypothesis.

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All errors remain the responsibility of the authors

Stock market driven acquisitions versus the Q theory of takeovers – The UK evidence

One of the more interesting theories to emerge from behavioural finance theorists in recent years has been that of market timing. Loughran and Ritter (2000) advance a theory of what they term "behavioural timing" which suggests that managers may seek to exploit perceived misvaluations of their firm's stock. This exploitation could, for example, take the form of issuing either equity or debt depending on perceived relative cheapness, or timing the decision to launch an initial public offering (IPO). Baker and Wurgler (2002) show that the financing structure of firms appears to be the result of past attempts to time the market. Shleifer and Vishny (2003) extend this market timing idea to suggest that firms make stock-financed acquisitions when their equity is highly valued, and in particular when it is more highly valued than the target's stock. Underlying all of these theories is the notion that management perceives the firm's stock to be misvalued by an inefficient market, and responds accordingly. In each case, they will be acting rationally and in the interests of existing stockholders, but at the expense of either new stockholders or new debtholders. For example, Loughran and Ritter (1995) and Baker and Wurgler (2000) show that stock returns are low following the issue of equity, and it is well-documented that stock returns are low following equity-financed acquisitions (Agrawal and Jaffe, 2000; Agrawal, Jaffe and Mandelker, 1995; Gregory, 1997; Loughran and Vijh, 1997; Rau and Vermaelen, 1998). A refinement of the theory of over-valuation driving mergers is found in Rhodes-Kropf and Viswanathan (2004, henceforth RKV) where both bidders and targets have private information about the stand-alone values of their firms, but valuations have market-wide and firm-specific components. Furthermore, the combination of these misvaluation effects means that the target cannot assess the true value of any synergies. A key difference between the Shleifer and Vishny (2003, henceforth SV) and RKV models is that the latter assumes that target management acts rationally and in the interests of the shareholders, whereas in the SV model target management are either compensated or have short horizons leading to a preference for "selling out".

Our focus in this paper is on the acquisition decision in the UK. SV point out that a management team in an over-valued company that pursues a stock-financed acquisition of a less over-valued target could be acting rationally, in that although stock returns will be low following the acquisition, they will nonetheless be higher than they would have been had management taken no action[1]. In fact this will only be the case if management pursue an otherwise successful post acquisition strategy. The somewhat mixed evidence from cash-financed acquisitions (e.g. Agrawal and Jaffe, 2000) does not suggest that this can be entirely relied upon, for the UK at least. Furthermore, there are alternative actions available to management in the case where stock is over-valued. They could, for example, simply issue equity, either to finance future investment or to retire debt. This is potentially an important issue in framing the research design to address the Shleifer and Vishny hypothesis. If one takes the view that an equity financed acquisition is the *only* way to exploit a perceived over-valuation of stock, compared to an alternative of doing nothing, then the best research design is to compare a sample of stock-financing acquirers with a matched sample of equivalently-valued but non-acquiring firms. This design is found in Ang and Cheng (2006). In effect, the model employed assumes that the decision to acquire is endogenous, and simply the result of a market misvaluation that has arisen. An alternative view is that the decision to acquire a firm is exogenous, and that it is the financing method, or possibly the timing of the takeover, that is endogenous to the misvaluation of the equity. If one takes this second view, then the appropriate research design involves studying acquiring companies, their financing choices, and the stock market performance following the acquisition decision. This is the type of research design employed by Dong, Hirshleifer, Richardson and Teoh (2006) and is also the design followed here. Rhodes-Kropf, Robinson and Viswanathan (2005) also study the set of bidding firms, but using a decomposition of market-to-book ratio approach. A recent paper by Savor and Lu (2009) attempts a third approach, namely comparing successful equity-financed bids with those that fail for what they regard as exogenous reasons.

In complete contrast to the market valuation models of mergers, under the Q-hypothesis of acquisitions as described in Dong et al (2006), firms are highly valued

[1] The RKV model leads to a similar prediction.

because they are well-run and have high NPV opportunities. Market values simply reflect growth opportunities and managerial ability. There is no particular reason for high-Q firms to prefer equity financing, although as Dong et al (2006, p.753) note, bidders with strong growth opportunities may prefer to preserve cash or keep gearing low in order to fund opportunities in the future. However, a critical difference between Q-theory and the valuation theories of mergers is that long run stock returns should be either positively related to, or unrelated to[2] Q irrespective of the form of financing, whereas under the SV hypothesis long run stock-returns will be negative for equity financed acquisitions, but not for cash-financed ones.

We study the UK market for two reasons. First, there is the usual (though nonetheless important) case for an out of sample test of the SV/RKV and Q hypotheses. If market valuation effects drive acquisitions and their financing, then *ceteris paribus*, one should find the effect exists in markets outside the US. However, markets have different ownership structures. For example, Andre and Ben-Amar (2008) describe Canada as having highly concentrated ownership with dominant family shareholdings, whilst Gregory and Matatko (2005, Table 1) discuss the very different ownership structure that prevailed in US and UK markets between 1975-1995, noting that "The relative unimportance of individual investors in the UK throughout the sample period means that there is less likely to be an emphasis on cash as a form of payment in acquisitions". In terms of concentration of ownership, Stapledon and Bates (2002, Table 2) show that the top twenty UK fund managers controlled 37.06% of the UK market by value as at the end of 1997, with the top three alone controlling just under 11%. Such concentration may mean that, to some degree at least, target shareholders are less likely to have the motivations claimed by SV, and may also be less likely to suffer from the information asymmetry that drives the RKV theory. In a concentrated market, we would also expect these fund managers to have a greater chance of identifying the market, sector and firm specific components of misvaluation identified in RKV. In short, there are reasons to suppose that stock market valuation effects on mergers should be weaker in the UK than in the US.[3]

[2] Unrelated as if markets are efficient the reaction takes place on announcement.
[3] However, note that Gregory (2000) finds no evidence that institutional shareholdings have an influence in determining the form of financing.

The paper now proceeds as follows. First, we describe the specific SV hypotheses that we set out to test, and contrast these with the predictions of Q-theory. Second, we describe the data set and the research method. Third, we show how, using simple univariate tests, the data seem to be consistent with valuation effects influencing the form of payment. Fourth, we examine whether the pre-bid and announcement period returns differ between equity financed acquisitions, and compare post-bid returns for equity and cash acquirers. We also examine whether relatively highly valued equity acquirers perform differently than relatively lowly-valued equity acquirers. We then go on to show that in a logit model which controls for factors that have been shown to influence the form of payment in UK studies, our proxies for valuation have a significant role to play in predicting the choice of financing method.

Finally, having shown that our proxies for valuation influence financing choice, we argue that the correct analysis of announcement period and longer-term performance requires that a treatment effects model is employed. We estimate such a model and show that once the effect of valuation on financing choice is taken into account, there is at least some modest evidence to support the conjecture that equity financing acquirers seem to be acting in the interests of their shareholders.

Hypothesis Development

SV (p.297) set out a number of predictions that arise from their model. We contrast these with those of Q-theory, explain which of these predictions we are able to test, and formalise hypotheses based on those predictions where appropriate. The specific predictions SV make are as follows:

(1) *acquisitions are disproportionately for stock when aggregate or industry valuations are high*. Q-theory is silent on this issue. We test this insofar as it related to aggregate (but not industry) market conditions. Specifically, the hypothesis we test is:

> H1: Higher market-wide valuation metrics will increase the probability of an equity-financed bid.

(2) *the volume of stock acquisitions increases with the dispersion of valuations amongst firms*. Q-theory makes no predictions in relation to this prediction, and we do not investigate this as it would require tests based on merger waves, which are beyond the scope of this paper.

(3) *targets in cash acquisitions earn low prior returns, whereas bidders in stock acquisitions earn high prior returns*. Whilst Q-theory has nothing to say about prior returns, the fact that inefficient targets (which would have under-performed) get acquired by more efficient bidders would be consistent with the theory's predictions. The critical difference is that under Q-theory there would be no reason to expect differences in prior returns conditional on the form of financing. The SV hypotheses we test in relation to this conjecture are:

> H2: Acquirers in equity financed acquisitions will have positive pre-bid returns;
>
> H3: Targets in cash-financed acquisitions will have negative pre-bid abnormal returns.

(4) *bidders in stock acquisitions exhibit signs of over-valuation*. This prediction implies that there are differences between the valuation ratios observed in cash financed bids and equity financed bids. We have two testable hypotheses that derive from this:

> H4: Valuation ratios of acquirers will be higher in the case of equity-financed bids than cash bids;
>
> H5: the valuation ratio of the acquirer will increase the probability of an equity-financed bid.

Under Q-theory, acquirers as a whole may be highly valued, as they are more efficiently managed and have superior investment opportunity sets, but we would expect no differences in valuations that vary with the form of financing chosen, so that the predictions from Q-theory are simply the nulls of H4 and H5.

(5) *long-run returns are likely to be negative in stock acquisitions, and positive in cash acquisitions*. This follows from the conjecture that stock-financing acquirers are

over-valued, whilst cash acquirers are not, but nonetheless that both firms act in the long run interests of their shareholders. This leads to two simple hypotheses:

H6: long run returns will be negative for equity financed acquisitions;

H7: long run returns will be positive for cash financed acquisitions.

Note that under Q-theory, market efficiency arguments suggest that no long run abnormal returns should be observed in either case – strictly all abnormal returns should be observed on announcement, and such abnormal returns should be non-negative. However, to the extent that any long run returns are observed, they should be non-negative and should exhibit no differences that vary with the form of financing, so the Q-theory hypothesis would be the null of H6.

(6) *despite these negative long run returns, acquisitions for stock serve the long terms interests of the acquirer.* This is because the acquiring firms successfully exploits its over-valued share price to buy less over-valued assets. In the strictest sense SV's sixth prediction is untestable, as it requires an unobservable counter-factual. Of course, one can come up with proxies for this, as the papers we discuss above attempt, but all such attempts suffer from the problem of endogeneity. As Savor and Lu (2009) note in the context of failed bids, it is essential that the reason for the bid failing is wholly unrelated to the bidder's valuation. Their proxies are a sub-sample of non-hostile bids that fail because of "regulatory disapproval (mostly antitrust action), subsequent competing offers, or unexpected target developments". However, it is arguable that failure because of a competing bid is not necessarily exogenous to the original bidder's valuation. Because of this difficulty of finding proxies that are truly exogenous (and indeed the difficulty posed by the likely small sample of such acquirers), we employ a different approach when investigating the sixth SV prediction, and employ a treatment regression to test our eighth hypothesis:

H8: Once the influence of mis-valuation, or relative mis-valuation, of the acquirer is allowed for, the effects of stock-financing on long run bidder returns will be mitigated.

(7) *acquiring a firm in another industry may yield higher long run returns than one in a related industry*. This leads directly to a simple hypothesis:

H9: conglomerate mergers will exhibit higher long run returns than mergers in related industries.

(8) *management resistance to some cash tender offers is in the interests of shareholders*, and;
(9) *management of targets either have relatively short horizons or are effectively "bought off" for agreeing to the deal*.
We do not attempt to test (8) and (9), partly because of the difficulty of determining "resistance" (see Schwert, 2000) and partly because we cannot observe either the personal pay-off or the time horizon of target managers.

Later in the paper, SV note that their model suggests that:
(10) *a more highly valued acquirer only makes a cash bid if the target is under-valued even at the bid price* (p.305*), i.e. that it is* ***absolutely*** *under-valued* (p. 308). This leads directly to two hypotheses:

H10: Targets will be under-valued in absolute terms in the case of cash bids;

H11: the valuation ratio of the target will decrease the probability of a cash financed bid.

But by contrast:
(11) *targets in stock acquisitions are undervalued* ***relative*** *to the acquirer* (p.308). This gives rise to the following hypotheses:

H12: Valuation ratios of acquirers will be higher than those of targets in the case of equity-financed bids;

H13: the relative valuation of the acquirer to the target will increase the probability of an equity financed bid.

Under the SV hypothesis, the only rational equity bidders are those that exploit their relative over-valuation. However, as their prediction (in [6] above) is that those firms which issue equity and are relatively over-valued compared to their targets are acting in the best interests of shareholders, their predictions imply that those firms that issue equity and are not relatively over-valued compared to their targets may not be. This leads to our final hypothesis:

H14: When acquisitions are for equity, bidder returns will be higher in cases where the acquirer is relatively over-valued compared to the target.

With regard to H10-H14, Q-theory is silent on financing choice, although one might invoke Martin's (1996) risk-sharing hypothesis to explain why highly-valued targets get acquired for stock in an efficient market. Alternatively, one might advance the previously described hypothesis in Dong et al (2006). The two clear predictions from Q-theory is that acquirers should have higher Q-ratios than targets, and that returns to acquirers should, on average, be either positive or not significantly different from zero.

Data and Research Method

Our sample is mainly drawn from the SDC-Platinum Database (Securities Data Company), from 1985 to 2004 (inclusive), but in the early years data are supplemented by the use of the *Acquisitions Monthly* AMDATA database. We require both acquirer and target firms to be UK listed companies on the London Stock Exchange, and for their monthly returns to be available on the London Business School Share Price Database (LSPD). The accounting data used in this research come from *DataStream*, with missing values hand-collected where possible from the *London Stock Exchange Official Year Book*. In addition, the market capitalisation data are collected from the LSPD.

We classify the sample according to the dominant method of payment. In this respect, it should be noted that there is a key difference between takeovers in the UK and takeovers elsewhere. In the UK, according to *The City Code on Takeovers and Mergers*, a share offer must be accompanied by a cash alternative offer if any shares have been purchased in the market for cash during the 12 months preceding the merger. This cash alternative has to be set, as a minimum, at the highest price paid for any shares in the market in this period. In practice, this means that a considerable number of UK takeovers are classified as shares and cash by SDC, when the reality is that many such takeovers are really stock financed deals with a regulatory cash alternative added on. Cooke, Gregory and Pearson (1994) provide some evidence on the generally low take-up of such an alternative. Accordingly, we use the following criteria to classify the method of payment:

if the method of payment is 100% cash, or cash with a loan note alternative[4], then it is a cash transaction;

if the method of payment includes some portion of shares, then it is a share transaction;

any alternative offers are classified as "other".

The total sample in this research is (initially) 805 acquisitions, with 251 being pure cash offers, 501 being share-offers and 53 deals being classified as "other". Given the paucity of information concerning the structure of the "other" bids[5], we choose to drop these from the analysis and concentrate on the distinction between equity and cash bids, which is at the heart of the SV hypothesis. For our basic tests we require accounting data on earnings and book values for both acquirers and targets, in order to compute a residual income valuation (RIV), and we require at least the announcement month returns to be available for both acquirers and targets which reduces our core sample to 669 matched pairs of acquirer and target firms. In a sensitivity analysis, we also investigate two sub-samples for which IBES forecast data is available. We take two cuts of this sub-sample. Sub-sample 1 (SS1) is that where there is forecast data available for at least the acquirer. This sub-sample consists of 460 matched acquirer and target firms. The second sub-sample, sub-sample 2 (SS2), is that where we require analysts' forecasts to be available for both acquirer and target firms. This allows us to investigate a matched sample of 321 acquirers and targets.

For these samples of firms, we estimate valuation models, as described below, together with announcement month and longer term abnormal returns. Our model for abnormal returns is the buy and hold abnormal returns (BHAR) model, with bootstrapped skewness adjusted t-statistics p-values calculated following Lyon, Barber and Tsai (1999). We report these returns for 12 and 36 months post acquisition for acquirers, and for 12 and 36 months pre-acquisition announcement month for both acquirers and targets. Given the evidence in Loughran and Ritter (2000) we present results for returns benchmarked against ten size-based control

[4] During the early years of our sample this was a common offer as the loan note alternative was a tax-efficient form of payment for some private investors.

[5] Where we are able to fully assess these bids, by cross-referencing to copies of *Acquisitions Monthly*, these typically involve equity like components, such as warrants or convertible loan notes. Nonetheless, because of the complexity of these deals, we exclude them from the analysis.

portfolios.[6] As in Lyon et al (1999), missing returns for firms lacking a full 36 months data are filled in with the size benchmark return.

The characteristics of our initial sample are presented in Table 1. We show acquiring firms characterised according to their size and book to market ratio (BTMV). We use deciles for size classification, and quintiles for BTMV classification, with an additional group (F) for those firms with negative book-to-market ratios. One striking characteristic from this table is that over one third of all equity financing acquirers are in the low (i.e. "glamour") book to market quintile, with 58% being in the two "glamour" quintiles. Not surprisingly, acquirers tend to be larger firms and this is particularly the case for cash acquirers.

We value our acquirers and targets using the residual income valuation (RIV) model employed in both Ang and Chen (2006) and Dong et al (2006), which follow the Lee, Myers and Swaminathan (1999, henceforth LMS) version of the Peasnell (1982) model.[7] The LMS model requires a consensus analyst forecast of earnings and dividends to be available from IBES for three years ahead. Unfortunately, such forecasts are not available for the UK for the full period of our study (they start in 1987) and are somewhat patchy, and we find a large number of instances where forecasts are missing. UK analysts typically only forecast two years ahead and this is reflected in the poor availability of third year forecasts. We also find many examples of missing dividend forecasts. Were we to rigidly insist on full 3 year forecasts of earnings and dividends, our sample would be reduced to less than 150 target firms. By contrast, one year ahead forecasts are far more common, and 92% of firms that have a one year ahead forecast also have a two year one.[8] Dividend forecasts are only available for 62% of the targets which have earnings forecasts. Accordingly, we need to modify the LMS model somewhat. As all analysts' forecasts are in nominal terms,

[6] An earlier version of this paper used both size and size and book to market matching, finding little qualitative difference between the model, although abnormal returns tended to be more negative for the size-matched BHARs. However, given our analysis here now reports results partitioned on book to market, we simply control for size in calculating BHARs.

[7] Often rather misleading referred to as the Ohlson (1995) model. The Ohlson model is a special case of the Peasnell model where abnormal earnings are assumed to mean revert according to a particular pattern which Ohlson terms a "linear information dynamic". In fact, the Lee et al (1999) framework is a special case of the Ohlson model where abnormal earnings are assumed to be persistent (ω=1) and where the value of Ohlson's "other information" variable is assumed to be zero.

[8] Note that even requiring any sort of forecast is not without cost. As we show later, the subset of firms for which forecasts are available exhibit less negative long term abnormal returns than the full sample.

we fill in missing forecasts by assuming earnings grow in line with inflation, plus a real growth term. For real growth we take the long run UK average real earnings growth figure of 1.6% reported in Gregory (2007).[9] For missing dividends, we assume that the dividend paid is the same as the latest financial year end pre-merger dividend. We could, of course, assume a constant payout rate, but given the evidence on "sticky" dividends this is a not unreasonable assumption and, if earnings are rising, is more conservative than assuming a constant payout.[10] The expected long term inflation rate (g_t) at time t in the UK is calculated by using the difference[11] between the yield on long-dated gilts (the UK equivalent of the long dated Treasury Bond) and the yield on long dated index-linked gilts (the UK equivalent of TIPS, which have been in existence in the UK since 1984). Last, we model the growth in long term RI using a mean reversion to industry ROE, as in LMS. We assume that RI declines from the end of year three to the end of year seven in a linear fashion, so that earnings from year eight to perpetuity are simply the industry ROE multiplied by the clean-surplus forecasted opening book value for year eight. We also sensitised our analysis by assuming mean reversion occurs over three, rather than eight, years. As results from this are very similar, we do not report the three year mean reversion period results. We could, of course, use longer intervals, but Gebhardt, Lee and Swaminathan (2001) show results are similar over horizons ranging from six to 21 years. Insofar as acquirers have higher implied forecasted ROEs than targets, choosing shorter intervals for mean reversion rather than longer ones means our tests of the SV valuation hypotheses are likely to be conservative.

Formally, our model is:

[9] We do not believe that the absence of long run earnings forecasts for the UK should be a particular cause for concern. For the UK, Capstaff et al (1995) show that besides exhibiting bias, the consensus analyst forecast fails to out-perform a random walk model of earnings at horizons greater than 15 months. More generally, using US data Bulkley and Harris (1997) show that analysts' long run earnings forecasts are so biased as to be employable in a successful contrarian investment strategy.

[10] It is tempting to invoke dividend irrelevance, but whilst this applies in the long term, in the short term the assumed dividend has a modest impact on value, as it influences closing book value and hence the following periods' RI.

[11] (1 + nominal rate)/(1 + index-linked rate) -1

$$\hat{V}_{it} = B_{it} + \frac{(FROE_{i,t+1} - k_{ei})B_{it}}{(1+k_{ei})} + \frac{(FROE_{i,t+2} - k_{ei})B_{it+1}}{(1+k_{ei})^2} + \frac{(FROE_{i,t+3} - k_{ei})B_{it+2}}{(1+k_{ei})^3} + \sum_{j=4}^{j=8} \frac{(FROE_{i,t+j} - k_{ei})B_{it+j-1}}{(1+k_{ei})^j} + \frac{(FROE_{i,t+9} - k_{ei})B_{it+8}}{(1+k_{ei})^8 . k_{ei}}$$

Where:

$FROE_{it}$ = Forecasted firm *i* ROE for years 1 to 3, using the fill-in procedure described above where analysts' consensus forecasts are missing, and assuming a five year linear fade rate to industry ROE after year 3, as described in LMS.

k_{ei} = Industry cost of equity, as described below

B_{it} = Equity book value of firm *i* in year *t*, estimated by a clean surplus relation for all years beyond year *t*.

In cases where the implied horizon value RI is negative (i.e. if industry ROE is below industry cost of capital), we replace the final implied RI term in the expression above with zero, so effectively assuming that at the end of the forecast period the firm is worth the closing book value implied by the short run earnings and dividend forecasts.

To estimate the above model we need an industry cost of equity capital, k_{ei}, and an industry average ROE. Our industries are based upon *Datastream* classifications and are the groupings described in Gregory and Michou (2009, Appendix A). Our industry ROE figures are rolling industry averages from *Datastream*, where we use up to ten years where they are available, but shorter intervals where the full ten years are not available. Our industry cost of capital then uses the industry beta estimates from Gregory and Michou (2009, Table 3, Panel A) in a CAPM framework. We assume the expected return on the market is a 5% *real* rate of return, this being broadly consistent with long run estimates of the UK cost of equity given in Dimson, Marsh and Staunton (2005), but we also sensitise our models by varying the cost of equity between 4% and 6% real.[12] Our real risk free rate is given by the index-linked gilt

[12] We prefer to estimate the cost of equity directly, rather than estimate an equity risk premium. The first reason is theoretical, in that as Jenkinson (1993) points out, the risk free terms in any CAPM need to be consistent. Second, from an empirical standpoint, Wright et al (2003) argue against the separate estimation of the risk free rate and an equity risk premium on the grounds that estimates of the return on equities exhibit more stability than estimates of the equity risk premium.

yield. Finally, our real estimated cost of capital is converted to a nominal cost using the implied inflation rate estimated as described in footnote 11.

Note that in any attempt to conduct an RIV valuation using forecasts, the estimates obtained are sensitive to both the cost of capital and the long run earnings growth assumptions used. One can "reverse engineer" an RIV model to extract an implied cost of capital (as, for example, in Claus and Thomas, 2001) or even jointly estimate the cost of capital and implied growth, as in Easton (2006), although his model cannot be applied at the level of the individual firm. Easton (2006) also notes that these estimates of cost of capital are sensitive to long run growth assumptions and this point will, of course, be equally valid in the calculation of any RIV model.

As we note above, to impose the requirement that consensus analysts' forecast be available reduces our sample considerably. Accordingly, we investigate an alternative, which simply involves assuming that for all firms the current year's abnormal earnings grow in line with long run inflation and therefore have zero real growth. As this makes the bland assumption that all firms have the same growth rates, we drop any industry specific cost of capital here, simply assuming a constant real cost of capital for all firms. This model gives results that are qualitatively similar to our reported results (in fact, results are slightly stronger, which may be due to the absence of any mean reversion to an industry ROE).[13]

Having obtained our firm specific estimate of value, $\hat{V}_{it}$, we then calculate a price to theoretical valuation ratio, such that values of the ratio greater than unity imply firms are over-valued. To avoid implausible values[14], we Winsorise the price-to-value ratio at the 5% level.

[13] We also experimented with the forward earnings growth (FEG) model of Ohlson and Juettner-Nauroth (2005), where short term growth is the consensus analyst's forecast growth from year 1 to year 2, and long run growth is based on industry ROE. Unfortunately, this model turns out to be capable of yielding some fairly wild estimates of value, that even with Winsorisation look unrealistic. We therefore dropped this model.

[14] In particular, note that the RIV model can potentially give rise to negative valuations if residual income is sufficiently negative.

Finally, in order to test H1, we collect proxies for market-wide valuations. We investigated several alternatives here, including the Financial Times All Share Index (FTASI) dividend yield, price earnings ratio, past 12 month return and a gilt-equity ratio calculated from the FTASI dividend yield (see Harris and Sanchez-Valle, 2000). Whilst all of these seem plausible proxies, a simple horse race indicates that the FTSE price-earnings ratio and the past 12-month return on the FTASI have better predictive power, for returns and form of financing respectively. As control variables, we also include proxies for interest rates, and size and relative size of acquirer and target, all of which have been found to be important in explaining the form of financing.

We test hypotheses H1, H5, H11, and H13 using a logistic regression model, although we also investigate H5, H11 and H13 using a simpler univariate approach. H2, H3, H6 and H7 are tested directly by investigating buy and hold abnormal returns (BHARs) and test statistics based on Lyon, Barber and Tsai (1999), with the addition of non-parametric tests for differences. H4, H9, H10, H12 and H14 are addressed with simple univariate tests. Finally, H8 is investigated using a treatment effects regression.

The rest of the paper is organised as follows. We start with a brief description of summary statistics, and then move on to our univariate analyses. This is followed by our analysis of pre-bid, announcement period and post-bid returns. We then move on to our logit regression analyses and treatment effects regressions. Finally, we discuss further tests of the alternative Q-hypothesis. Throughout our analysis, we footnote cases where our sensitivity analyses of SS1 and SS2 yield results that differ in terms of significance from those reported, but otherwise results from these sensitivity analysis sub-samples are qualitatively similar. Full tabulated results for these sub-samples are available from the authors on request.

Results

Summary statistics for our variables are reported in Table 2, where we partition the sample according to the form of bid financing. The table shows the mean and standard deviation for each of the following variables: the acquirer's announcement month return (*acqar*); the acquirer's buy and hold abnormal return (BHAR) for 1 year (*acq1bhar*) and 3 years (*acq3bhar*) post acquisition; the acquirer's pre-bid BHAR for

1 year (*acqp1bhar*) and 3 years (*acqp3bhar*) pre-acquisition; the acquirer's price to residual income valuation (RIV) ratio (*acqprv*); the acquirer's book to market value (*acqbtmv*); the target's announcement month return (*tarar*); the target's pre-bid BHAR for 1 year (*tarp1bhar*) and 3 years (*tarp3bhar*) pre-acquisition; the target's price to RIV ratio (*tarprv*); the target's book to market value (*tarbtmv*); a dummy variable (*cong*) equal to one if the acquisition is cross-industry, zero otherwise; the 12-month pre-bid return on the FTASI (*dmkt*); the PE ratio on the FTASI (*ftseper*); the yield on long-dated index-linked gilts (*indexyield*); the natural logarithm of the acquirer's market capitalisation (*lnacqcap*); the natural logarithm of the market value of the target to the market value of the acquirer (*logrelsize*); the difference between long gilt yields and the Treasury Bill rate (*longshort*); and the relative price to value ratios of acquirer and target (*overval*), equal to *acqprv* divided by *tarprv*. The final two columns show the differences between variables with the p-value from a two-tailed t-test assuming unequal variances. Significant differences are found between share financed and cash financed acquisitions with regard to *acq3bhar*, *acqp1bhar*, *acqp3bhar*, *acqprv, acqbtmv*, *tarar*, *dmkt*, *lnaaccap*, *logrelsize* and *longshort* variables. We discuss more detailed tests for differences below, where we include non-parametric tests for differences, but in particular note that simple t-tests for differences are mis-specified if BHARs are skewed.[15]

For reasons of space, we do not report correlation matrices, but note that both one and three year BHARs are highly correlated, and that this is also the case for the pre-bid BHARs. As would be expected, book-to-market ratios (our proxy for the inverse of Q) and our price to value ratio exhibits a significant negative correlation (-0.5).

Simple Univariate Tests of Valuation and Method of Payment

In Table 3, we examine the differences between the price to value ratios of acquirers and targets, separated between cash and equity deals, in order to test hypotheses H4, 10 and 12. We also compare the book to market value ratios (our proxy for Tobin's Q) by type of financing. Turning to the price to value (P/V) ratios, we see that, as

[15] Note one important feature of the SS1 and SS2 samples is that the size of the acquirer increases and the (negative) 3 year post acquisition BHAR decreases in absolute terms. The former is consistent with some form of size bias in the availability of IBES forecasts, whereas the latter is consistent with some form of backfill or survivorship bias. The fact that so many target forecasts are missing is also consistent with these two effects. The problem seems particularly acute in the early years of our sample, which is worth bearing in mind when considering the results from our sensitivity analyses.

predicted by the SV hypothesis, the P/V ratio for acquirers, at a mean of 1.78 for the sample of equity acquirers, shows evidence of over-valuation and is substantially above the P/V ratio for targets, as expected under H12. The t-test results show acquirers have a P/V ratio significantly greater than 1.0, and we see clear evidence that the P/V ratio for acquirers is significantly higher than that of the target in the case of equity bids, no matter whether a conventional t-test or a non-parametric Mann-Whiney test is employed. According to H4, valuation ratios should be greater for equity acquirers than cash acquirers, and this is indeed the case. Note that the t-test for differences reported is the probability from a *two*-tailed test assuming unequal variances, so that if we wish to test whether H4 is supported the correct test probability is half that shown in the table. Accordingly, we conclude that the evidence supports H4 and H12.[16]

Turning to H10, we fail to find any support for the SV hypothesis that targets are *absolutely* under-valued in the case of cash bids. In fact, for both the equity and cash the sample groups in Table 3 the P/V ratio for the target is significantly greater than 1, and there is no evidence from the difference tests that targets are more lowly-valued in the case of cash deals, than equity deals. Under the Q-hypothesis the book to market difference should be significant for both cash and equity deals. Whilst this is the case in the combined sample of bids, it only holds for the equity financing acquirers. Cash acquirers have book to market ratios that fail to be significantly lower than those of their targets, something that is difficult to reconcile with Q-theory. There is also some evidence (though not from the non-parametric tests) that book to market ratios are lower in the case of equity-financing acquirers than cash-financing acquirers.[17] Of course, one might rationalise this using Martin's (1996) risk-sharing hypothesis if target book-to-value ratios were lower in such cases, but they are not.

We can also test whether the propensity to use equity financing varies according to the P/V ratio of the acquirer or target, or their relative valuations, and this is our first

[16] Nonetheless, in SS2 the t-test difference fails to be significant at the 5% level, although the MW test shows the difference is significant. However, given we are testing the *acquirer's* valuation in H4, there is little reason to restrict the sample to cases where we have analysts' forecasts for both acquirer and target.

[17] Except in the case of sub-sample 2. Note, though, that although we report sub-sample results for the purposes of comparison, there is no reason, when testing the Q-hypothesis, to restrict the sample size to cases where analysts' forecasts are available for either acquirer or target.

test of hypotheses H5, H11 and H13. We could simply split the sample into high and low valuation groups, but to do so would not recognise that if an acquirer is roughly correctly valued, management might be indifferent when it comes to the choice of financing.[18] Accordingly, we split the sample into quantiles, choosing the Fama-French breakpoints of 30% and 70% for P/V and relative over-valuation ratios.[19] The results are reported in Table 4, where the lower quantile is the bottom 30% by P/V (or relative over-valuation) and the upper quantile is the top 30%. The first two columns test for differences in target valuation and proportion of equity financed bids when P/V is defined using the acquirer's P/V ratio, the next two columns test for differences in acquirer valuation and proportion of equity financing when the target's P/V ratio is used to define the quantiles, and the final three columns show what happens when the relative over-valuation is used to define quantiles. Again, the t-test probabilities are from two-tailed tests. Target values are higher when acquirers are more highly valued, and the proportion of equity deals is higher when the bidder has a higher P/V ratio.[20] This is consistent with H5. Looking at *relative* over-valuation, we see evidence that equity financing is more likely when the acquirer is relatively over-valued compared to the target, consistent with H13. However, as is also clear from the central columns of the Table, there is no evidence that target valuation predicts the form of financing, which is inconsistent with H10 and H11. For reasons of space, we do not repeat Table 4 using book-to-market ratios, but the results from doing so are similar to those reported, which seems more consistent with BMV being a proxy for over-valuation rather than investment opportunities.

Tests for differences in returns

In Table 5 we test the SV predictions regarding pre and post bid abnormal returns. We start with pre-bid abnormal returns, reported in the first panel. Tests for the BHARs being significantly different from zero are conducted using the Lyon et al (1999) bootstrapped skewness-adjusted t-statistic. We see that pre-bid returns for acquirers overall are significantly positive at both 12 month and 36 month pre-bid horizons, and that returns for targets are negative at both horizons.[21] These results are as one would

[18] We are grateful to an anonymous referee for this point.
[19] Our results are robust using alternative cut-offs of the 40th and 60th percentiles.
[20] In all but sub-sample 2 (where a one tailed t-test is only significant at 5.7%). Again, though, there is no reason to require targets to have analysts' forecasts when appraising acquirer valuation ratios.
[21] Although the significance levels are marginal in the case of sub-sample 2

expect under either Q-theory or the SV hypothesis. The critical difference between them is that under the SV hypothesis pre-bid returns will vary with the form of financing. We see this is indeed the case. Precisely as predicted by H2, pre-bid returns are strongly positive in the case of equity financing acquirers, with the mean pre-bid BHAR being 29.63% in the 12 months pre-bid for equity acquirers, and 66.46% over the 36 months pre-bid. Cash acquirers exhibit more modest outperformance, with a BHAR of 22.66% being significant over the 36 months pre-bid.[22] A Mann-Whitney test for differences[23] shows equity financing acquirers have significantly higher pre-bid returns in both periods. These results seem entirely consistent with the SV hypothesis. However, the SV hypothesis also predicts (see H3) that targets in cash acquisitions will have negative pre-bid BHARs. Whilst overall targets have negative returns, and cash acquirers have significant negative 12-month BHARs, we see no reliable evidence that cash targets perform significantly worse than equity targets. The conclusion is that whilst H2 is supported, H3 is not.

So far, target valuations excepted, the majority of our results are supportive of the SV hypotheses, but as Dong et al (2006) point out, they could also be supportive of the Q-theory of takeovers. Under Q-theory, acquirers have higher market to book ratios (a proxy for Tobin's Q) and higher pre-bid returns than targets because they are more efficiently managed. As Q-theory is silent on the relationship between valuation and financing, fully distinguishing between these competing hypotheses implies that we need to look at post-announcement returns, and also to look more closely at the factors that influence the form of financing. Accordingly, we now investigate these two issues.

One way we can reliably distinguish between the Q hypothesis and the SV hypothesis is to examine the post-acquisition returns of bidding firms. Under the SV hypothesis, equity financing acquirers would be expected to perform worse than cash financing acquirers. By contrast, under the Q-hypothesis, it is presumably the case that either low Q acquirers should perform worse than their high-Q counterparts, or that relatively lowly-rated acquirers should perform worse. Of course, if markets are

[22] In the sub-samples, equity-financing acquirer BHARs are always significant, but cash financing acquirer BHARs are not.
[23] Given the statistical properties of BHARs, we do not report conventional t-tests for differences.

efficient, then this effect should appear at announcement. But the SV hypothesis is quite explicitly a misvaluation hypothesis, and the authors specifically state that it is the *long* run returns that will be negative (p.305). RKV also imply a concern with long run price corrections (p.2688). Although we report short run announcement month returns, we concentrate on the longer run BHARs to examine the competing hypotheses. We choose 1 year and 3 year BHARs simply because the years of our study (with acquisitions up to and including December 2004) do not allow the computation of full 5 years returns for the later years in our sample.

In the second panel of Table 5 we report the overall mean acquirer announcement month return (*acqar*), and the target announcement month return (*tarar*) for each sub-sample. We again allow for non-normality in returns by using Lyon et al (1999) bootstrapped skewness adjusted t-tests and Mann-Whitney non-parametric tests for differences. Under the Q-hypothesis, we would expect no difference in announcement month returns. Under the SV hypothesis, it would be reasonable for markets to anticipate equity-financing signals an over-valuation. Our results regarding target returns are in line with those from earlier studies (e.g. Draper and Paudyal, 1999) which show strong and significant returns to target firms which are significantly greater in the case of cash bids. For acquirers, abnormal returns are negative in the case of equity deals, but not significantly so.[24] The 1.06% difference in returns between equity and cash acquirers fails to be significant at conventional levels unless one is prepared to accept a one-tailed t-test for the significance of equity returns being less than those from cash at the 10% level.

Of course, the SV hypothesis is concerned with predicting long run returns not short run returns, so we now turn to those results in the final panel of Table 5. Perhaps not surprisingly, given the long history of research into bidder returns (see, for example, Agrawal and Jaffe, 2000) we see that overall returns are significantly negative at both horizons with the one year post bid returns being -6.84% and the three year post bid returns being -15.41%. For equity acquirers, the 12-monnth BHAR is a significant

[24] However, equity acquirer returns are significantly negative in the case of sub-sample 1, as are differences in returns between equity and cash acquirers.

-8.21% and the 36 month BHAR is a significant -20.18%. At both these horizons the returns to cash acquirers are negative but not different from zero.[25] Differences between cash and equity acquirer BHARs are significant at the 36-month (although not at the 12-month horizon), with the difference being 13.82%. This is a major challenge to Q-theory, as it is hard to reconcile long run bidder returns that are negative overall, with the return depending on the form of financing, with that theory's predictions. By contrast, consistent with the SV hypothesis the results support H6, although they do not support H7 as cash acquisitions do not show returns that are significantly positive.[26]

Our last test in this section is our first pass at investigating the specific prediction of the SV model (p.305) that relatively over-valued acquirers undertake equity-financed acquisitions of relatively less over-valued targets, and that this is in the long-run interests of shareholders. Accordingly, in Table 6, we report the results for equity-financed acquisitions, after partitioning on the basis of relative values. An acquirer is relatively over-valued if its price-to-value ratio is greater than that of the target, and relatively under-valued otherwise. Rather than partition solely on the basis of a simple over or under valuation criterion, we report the results for varying degrees of over or under valuation. In the Table, the "Over by >x%" columns show the results where acquirers are relatively over-valued compared to the targets, and the "Under by >x%" columns show cases where the acquirers are relatively under-valued compared to targets. The first three columns show the results for the sample of acquisitions and mergers where over / under valuation is defined by a simple partition into "over" and "under" valued categories; the following three show the results for the sample of acquisitions for which acquirers are relatively over valued by 10% or relatively under-valued by 10%; and the final three show the results for the sample of acquisitions for which acquirers are relatively over valued by 20% or relatively under-valued by

[25] They are positive (though not significantly so) in the case of sub-samples 1 and 2.

[26] We also test whether returns vary according to whether returns vary by either the acquirer book-to-market ratio or the relative book-to-market valuation ratio. There is no evidence of any difference. We do not report these results as the lack of any significant differences provides no evidence one way or the other on Q-theory.

20%.[27] Of course, if the SV hypothesis is strictly correct, we should see no firms using equity financing if they are *not* relatively over valued. Table 6 shows the acquirer's announcement period and long run returns, together with the target's announcement period return. In no cases do the acquirer announcement period returns vary significantly between the two groups. Turning to the long run BHARs, both 12 month and 36 month BHARs are always worse for the group that should not, according to SV, have used equity financing, but whilst all the BHARs are significantly negative for this "relatively under-valued" group, no matter how the sample is partitioned, the differences always fail to be significant, although it is worth remembering that because of the skewed nature of BHARs, all our difference tests employ a non-parametric Mann-Whitney U-test, which will lack power to reject the null hypothesis. However, as we move across columns in the Table to progressively greater degrees of relative over/under valuation, we see that the "SV rational" group of equity issues (i.e. those that are relatively over-valued) experience less negative BHARs at the 12-month horizon. Indeed, for the 20% relatively over-valued group, the 12-month BHAR is not significant. Whilst there is a hint of support for the SV hypothesis here in the 12-month returns, there is no convincing evidence for H8 or H14 as after 36 months all BHARs are significantly negative. Furthermore, as we argue later, a more robust methodology is needed to test this hypothesis. Before leaving the discussion of this Table, we note an intriguing difference in target returns between the sub-groups. Announcement period returns to targets are far greater when the acquirer is relatively over-valued compared to the target than when it is not, and this effect is robust across all the alternative relative valuation cut-offs. To some degree, this may be consistent with the SV claim that acquirer buys-off a target management, who might infer that the acquirer is relatively highly valued and so require a better exchange ratio to accept the deal.

Logit regression tests of acquisition financing

In keeping with the Dong et al (2006) and Ang and Cheng (2006) studies we undertake a logit regression analysis to analyse the method of payment. Above, we have examined univariate tests, which are helpful in shedding some light on the

[27] We also partition using a 30% over/under valuation, where the sample consists of 206 relatively over-valued and 90 under-valued firms, and also by using the 30/70 quantile cut-offs described in Table 4. The results are qualitatively identical to those reported for the 20% over/under valued cut-off.

financing decision, but a more rigorous method of testing the form of consideration is to run a logistic regression on the method of payment, where the dependent variable is equity financing. We test the SV hypothesis relating to market-wide metrics using two alternative proxies for market values, the past 12-month market return term, *dmkt*, and the FTASI PE ratio.[28] Our other market timing variable is designed to pick up the effect of the underlying real interest rate, as measured by the difference between long and short risk free interest rates, *longshort.* We also control for the log of the relative size of acquirer and target. We test several versions of the model. First, we simply include the acquirer and target P/V ratios. Second, we use the three quantile groups (bottom 30% by P/V [Group 1]; mid 40%; top 30% by P/V [Group 3]) defined earlier as way of avoiding the influence of any outliers on the regression. Third, we specifically model the effects of *relative* valuation using the relative valuation ratio. We examine this using both a simple relative over-valuation dummy, *reloveral*, equal to one if the acquirer is relatively over-valued compared to the target, and by using the three quantile groups for the degree of over-valuation. Last, we investigate whether the book-to-market ratio forecasts financing choice. Under Q-theory, once market and size variables have been allowed for, we argue that the acquirer's book to market ratio should not influence the form of financing.

For reasons of space, we do not report regressions using the FTSASI PER, as they have marginally lower explanatory power than those that employ the *dmkt* variable. The results using the latter proxy for market-wide valuations are reported in Table 7. The significant variables are the prior 12 month return on the market (consistent with H1), the long minus short interest rate, the log of relative size, and the acquirer P/V ratio. The target P/V ratio is simply not significant. The results when valuation is defined by group are very similar, suggesting that the significance of acquirer P/V is not driven by outliers. For the relative valuation model, we see that irrespective of whether a dummy variable or a grouping variable is used to define relative over-valuation, relative over-valuation is a significant predictor of the likelihood of equity financing. Last, in the final two columns of the Table, we see that this result, that price-value predicts financing, carries across to BMV. This seems consistent with

[28] As discussed earlier, we also tested our model using the dividend yield on the index and the gilt-equity yield ratio, with similar but weaker results.

BMV being a proxy for over-valuation rather than the investment opportunity set.[29] Taken as a whole, these results provide support for H1, H5 and H13, but no support for H11.[30]

Tests of long run acquirer performance contingent on the decision to issue equity

The above findings clearly show that market timing variables, acquirer valuation and relative valuation ratios, together with variables capturing the size of acquirers and targets are important determinants of the acquirer's financing decision. Neither the Ang and Chen (2006) nor the Dong et al (2006) papers investigate the long run performance of equity acquirers relative to cash acquirers. Yet as we noted earlier this matter would seem to be critically important in assessing the SV hypothesis. Under the SV hypothesis, we would expect under-performance of equity acquirers relative to that of cash acquirers, but the acquisition itself represents the rational exploitation of over-valued equity by the acquirer's management.

It is tempting to run a regression to try and detect any abnormal performance, either in the form of two regressions for the equity and cash sub-samples, or one regression with a dummy variable for *shares*. Indeed, if we run the latter model we find that *shares* is a significant explanatory variable, implying that issuing equity has a negative impact on post bid returns. The only other variable with power to predict 36 month BHARs are the FTSE PE ratio. Unfortunately, it turns out that an OLS regression approach to assessing the impact of equity issuance is incorrect. For example, Greene (2000, pp 933-4) shows that if we try to estimate the regression:

$$R_i = \beta' x_i + \delta S_i + \varepsilon_i ,$$

Where R_i is a measure of abnormal returns and S_i is a dummy variable=1 if the takeover is financed by equity, in general the OLS estimate of S_i will over-state the effect of an equity offering because of self-selection bias. The managers that select

[29] Using SS1, we obtain largely similar results, but with one important caveat, which is that consistent with H11 the target P/V ratio becomes a weakly significant negative predictor of equity financing when valuation ratios are defined using groups. Past market returns also have a weaker role to play when absolute, rather than relative, valuation models are employed. In all cases, the pseudo R-squared ratio improves considerably and most strikingly of all, acquirer P/V and the relative valuation ratios are now significant at the 1% level. For SS2, pseudo R-squared shows a further marginal increase, and the acquirer and relative valuation metrics are again significant at the 1% level. Target P/V ratios now exhibit no significance at conventional levels however, and *dmkt* loses its significance.

[30] Except in the SS1 sample. See FN 29.

equity may do so because of factors that were expected to influence returns, such as over-valuation. The correct approach here is to model the decision on financing using a first stage probit model, and then form a selectivity correction term (or "hazard" function), λ_i, which is incorporated in a second-stage OLS regression (Maddala, 1983; Greene, 2000, p.934), known as a "treatment effects" model. Alternatively, we can adopt a maximum likelihood (ML) approach. We follow the latter procedure and run the model using the ML treatment effects procedure available in Stata, which allows us to use a Huber/White/sandwich estimator of the variance.[31] For the first stage model we use as predictors the variables used in the logistic regression. In the second-stage regression we employ the 36 month BHARs. The point here is that if SV are correct, and managers are issuing equity in response to over-valuation, once that valuation is taken into account then the coefficient on shares should not be significant. We also include proxies for market-wide conditions (we use the same variables outlined before, but find the best predictor of future returns is the FTSE PE ratio) and interest rates (again, we try alternative proxies but find the index linked gilt yield has the best explanatory power). We include the target announcement period return, as a simple test on whether over-payment influences the outcome (dropping this variable makes no qualitative difference to our results), a measure of acquirer size (the log of the acquirer's market capitalisation, *lnacqcap*), and a dummy variable for conglomerate mergers as a direct test of H9. We also investigated the effect of including relative size in our second stage regression, but as it was never significant we do not report results that include this variable.

The results are shown in Table 8. We report results for the sample using both absolute and relative P/V metrics, and also report results using our quantile versions of these two variables, giving four alternative models in all. The tables show the second stage, or augmented regressions, the results from the first stage probit (which, as one would expect, are similar to those from the logit model), the selectivity correction term, lambda, and two Wald tests. The first reports a Wald test of whether

[31] A particular difficulty when using BHARs as the dependent variable in regression tests of any type is the problem of influential observations. BHARs are both skewed and exhibit leptokurtosis. We are therefore careful to estimate our regressions, in the simple OLS and in all subsequent regressions, using a Huber/White/sandwich estimator of the variance. An alternative method of dealing with the skewness and kurtosis in the BHARs is Winsorising the 36-month BHARs. Winsorising at 5% gets rid of most of the skewness and kurtosis and leads to more significant regressions, strengthening the significance of the "shares" term.

the error terms from the first and second term regressions are correlated. The second Wald Test is a test of whether all the terms in the second stage regression are jointly significant. We note that in contrast to the simple OLS results, the *shares* variable is no longer significant once valuation effects are considered. No matter which specification of the first stage model is employed, only two factors now appear to predict returns – the market-wide PE ratio, which has a positive coefficient, and size, which also has a positive coefficient. Clearly *cong* has no role to play in explaining returns, and neither did it do so in a simple OLS regression, so we can reasonably conclude that H9 is not supported. The second Wald test shows that the terms (excluding the constant) in the second stage regression are not jointly equal to zero. Ironically, though, the first Wald test shows that we cannot reject the hypothesis that the two equations are independent. The fact that *shares* now has a coefficient not significantly different from zero provides some comfort for the SV hypothesis, but the fact that the two equations are not significantly independent falls some way short of convincingly supporting H8.[32]

Further tests of the alternative Q-hypothesis

We undertook several further tests to check whether the Q-hypothesis had any power in explaining long run returns. We do not report the relevant tables for space reasons, but simply summarise the results. First, we tested 36-month BHARs of the upper and lower quantiles of acquirers by book to market category, where quantiles were established as described in Table 4. Both quantile groups had significant negative BHARs that were almost identical to one another. We next separated acquirers into quantile groups according to the relative book to market of the acquirer and target, with similar results. Our final tests employed OLS regressions, similar to those described above, but excluding a *shares* term.[33] If the Q-hypothesis is correct, we might observe a negative relationship between book to market, or relative book to

[32] For models based on SS1, results are generally very weak. For models based on SS2, we find the following differences. First, size if no longer a significant predictor of return, but the target announcement period return has an economically and statistically significant impact on shareholder returns. Every one percent increase in target returns decreases the 36 month BHAR by around 0.32%. The positive relation between the FTSE PE ratio and BHAR remains, and the coefficient on *shares* now falls to a negligible amount. Where the simple OLS regression estimates suggested a significant impact on BHAR of -18.7%, the augmented regressions show a much reduced effect. The maximum impact (when relative over-valuation is used in the first stage regression) is an insignificant -4.4%.

[33] As there is nothing in Q-theory to suggest that form of financing should be associated with returns, there is no theoretical reason to run a treatment effects model.

market, and return, as low book to market firms are those with managerial skill and the best growth opportunities in theory. In fact, we find a positive but not significant association between acquirer book to market and relative book-to-market. In addition, we find acquirer size and the FTASI PE ratio are positively associated with BHAR, but target announcement period return has a negative association.

Conclusions

In this paper, we have explored the SV and Q hypotheses of takeovers using a new sample taken from a market that has not so far been subject to a test of the SV hypothesis. Most of our findings are broadly supportive of the SV market-driven theory of takeovers. Proxies for acquirer over-valuation seems to increase the probability of an equity offer, even after market timing and relative size effects have been allowed for. "Over-valued" acquirers also tend to buy "over-valued" targets. Our finding that acquirers are more highly valued than their targets adds support to the SV hypothesis, but is also consistent with the Q-hypothesis. We also find that the pre-bid returns for equity acquirers are significantly higher than those for cash acquirers, a result predicted by SV, and some evidence that cash targets have underperformed pre-bid. However, we do not find any evidence that cash targets perform significantly less well pre-bid than equity targets, and this is not consistent with the SV predictions. Of course, this result that targets under-perform whilst acquirers out-perform is entirely consistent with Q-theory, but that theory does not predict that pre-bid returns vary by form of financing. That said, one can argue that particularly successful firms may have exhausted their free cash flow on other growth opportunities, in which case these findings would not amount to a rejection of Q-theory.

We argue that the best way of distinguishing between the SV and Q hypotheses is to examine long run returns, since SV specifically predict that these should be negative for equity financing acquirers, although not as negative as they would have been if the acquisition had not taken place. By contrast, the Q-hypothesis would predict that long run returns should either be positive or at worst, zero. We find that for equity-financed takeovers long-run abnormal returns are significantly negative, whilst for cash acquirers the returns are not significantly different from zero. We also partition the sub-sample of equity acquirers according to whether or not they were *relatively* over-valued. According to SV, only relatively over-valued acquirers would undertake

an equity financed merger. Whilst the relatively over-valued group have better performance, the difference is not significant.

Central to the SV hypothesis is the notion that over-valued acquirers exploit their over-valuation to buy less over-valued targets. Our main test of this is conducted using logit regressions. Here, the evidence in favour of the SV hypothesis is robust and in line with that from the US investigations. We see clear evidence that highly valued acquirers and relatively highly valued acquirers are significantly more likely to use equity financing. However, there is limited evidence that under valued targets are more likely to attract cash bids.

Given our finding that the form of financing can be predicted by valuation related variables, we argue that a treatment effects model should be used in any subsequent analysis of long-run abnormal returns. There is some support for the SV proposition that managers of over-valued firms may be acting rationally in buying relatively under-valued targets for equity, but we are unable to demonstrate strong support for this. Using a different methodology, our results here are in some contrast with the US findings from Ang and Cheng (2006) and Savor and Lu (2009).

Whilst our results are generally consistent with the SV hypothesis, and by extension are supportive of the RKV model, there are some results that are not consistent with SV. First, except in some versions of the logit model, we are unable to detect that variation in the value of target firms has any consistent significant influence on the probability of an equity offer. This result differs from that of Ang and Cheng (2006) and Dong et al (2006). Second, we can reject the SV prediction that conglomerate mergers may have higher returns than industry related mergers. We should also note the SV predictions that we do not test. First, we do not test any of their predictions relating to merger waves. Neither do we test predictions relating to target resistance. Finally, we do not test whether acquirers exhibit other features of over-valuation. In particular, SV highlight earnings management and director share sales. There is evidence that UK firms manage earnings ahead of equity financed deals (Botsari and Meeks, 2008). An analysis of directors' dealing before bids would also shed some light on whether directors are knowingly exploiting mis-valuation, as predicted by the SV hypothesis, or whether they are simply over-confident. In this regard, Malmendier

and Tate (2008) provide interesting evidence of over-confidence amongst acquiring firm CEOs. As an anonymous referee has pointed out, a plausible explanation of our results might be that over-valued firms are simply firms with a strong price run up, and that the managers in those firms are likely to suffer from hubris. They will finance bids with equity to conserve financial slack. Given we find a significant correlation between prior abnormal returns and over-valuation, and (in unreported logit tests) we find that prior returns also have predictive power in explaining the decision to acquire using equity, most of our results that support the SV hypothesis can be also interpreted as being consistent with this alternative "hubris"-type hypothesis. The only way that we can see of testing this is to examine the trading activity of the acquiring firm's directors. SV specifically predict that there will be evidence of stock selling by insiders in over-valued firms that finance bids by equity. This test of the hubris hypothesis versus the SV hypothesis is a matter worthy of detailed investigation in its own right, and we leave that for future research.

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Table 1: Acquirer Size and book to market (BTMV) details

Each year from 1985 to 2004, all firms recorded in LSPD are sorted on their market capitalisation in descending order, and are used to classify all our acquiring firms into 10 size deciles, deciles 1 contains largest firms, while deciles 10 contains the smallest firms. Acquirers are assigned into their appropriate size deciles according to their individual market capitalisation at the beginning of the year of acquisition. We also collect all the book-to-market values (BTMV) for all the firms recorded on LSPD each year from 1985—2004 for which book-to-market ratios are available on *DataStream*, and divide all the firms with positive BTMV ratios into 5 groups, with Group A containing the lowest BTMV ratio firms ("growth or glamour firms"), and Group E contains the highest BTMV ratio firms ("value" firms). Our acquiring firms are allocated into the appropriate BTMV group in each year based upon their end June BTMV ratios. All firms with negative BTMV ratio are assigned into a separate group. Distributions of the acquiring firms are shown below.

Size Decile	Whole sample	%	Shares	%	Cash	%
Large, 1	213	31.8%	111	25.3%	102	44.2%
2	105	15.7%	64	14.6%	41	17.7%
3	93	13.9%	64	14.6%	29	12.6%
4	78	11.7%	60	13.7%	18	7.8%
5	41	6.1%	35	8.0%	6	2.6%
6	38	5.7%	28	6.4%	10	4.3%
7	46	6.9%	37	8.4%	9	3.9%
8	32	4.8%	20	4.6%	12	5.2%
9	16	2.4%	13	3.0%	3	1.3%
Small, 10	7	1.0%	6	1.4%	1	0.4%
Total	669	100.0%	438	100.0%	231	100.0%

BTMV Quintile	Whole sample	%	Shares	%	Cash	%
Low, A	211	31.5%	152	34.7%	59	25.5%
B	139	20.8%	102	23.3%	37	16.0%
C	99	14.8%	70	16.0%	29	12.6%
D	96	14.3%	50	11.4%	46	19.9%
High, E	116	17.3%	61	13.9%	55	23.8%
Negative	8	1.2%	3	0.7%	5	2.2%
Total	669	100.00%	438	100.0%	231	100.0%

Table 2: Summary Statistics. The table shows summary statistics (mean and standard deviation) for each of the following variables: the acquirer's announcement month return (*acqar*); the acquirer's buy and hold abnormal return (BHAR) for 1 year (*acq1bhar*) and 3 years (*acq3bhar*) post acquisition; the acquirer's pre-bid BHAR for 1 year (*acqp1bhar*) and 3 years (*acqp3bhar*) pre-acquisition; the acquirer's price to residual income valuation (RIV) ratio (*acqprv*); the acquirer's book to market value (*acqbtmv*); the target's announcement month return (*tarar*); the target's pre-bid BHAR for 1 year (*tarp1bhar*) and 3 years (*tarp3bhar*) pre-acquisition; the target's price to RIV ratio (*tarprv*); the target's book to market value (*tarbtmv*); a dummy variable (*cong*) equal to one if the acquisition is cross-industry, zero otherwise; the 12-month pre-bid return on the FTASI (*dmkt*); the PE ratio on the FTASI (*ftseper*); the yield on long-dated index-linked gilts (*indexyield*); the natural logarithm of the acquirer's market capitalisation (*lnacqcap*); the natural logarithm of the market value of the target to the market value of the acquirer (*logrelsize*); the difference between long gilt yields and the Treasury Bill rate (*longshort*); and the relative price to value ratios of acquirer and target (*overval*), equal to *acqprv* divided by *tarprv*. The "Diffs" column shows differences between share financed and cash financed acquisition, and the T-test p-values in the final column are probabilities from t-tests assuming unequal variances.

Variable	Cash	Shares	All	Diffs
	Mean (SD)	Mean (SD)	Mean (SD)	Cash-Shares
No. obs	231	438	669	(p-value)
acqar	0.001	-0.009	-0.006	0.01
	(0.10)	(0.13)	(0.12)	(0.24)
acq1bhar	-0.042	-0.082	-0.068	0.04
	(0.35)	(0.39)	(0.38)	(0.18)
acq3bhar	-0.064	-0.202	-0.154	0.138
	(0.74)	(0.82)	(0.80)	(0.03)
acqp1bhar	0.065	0.296	0.217	-0.231
	(0.76)	(1.62)	(1.39)	(0.01)
acqp3bhar	0.227	0.665	0.513	-0.438
	(1.92)	(2.06)	(2.02)	(0.01)
acqprv	1.559	1.78	1.704	-0.221
	(1.40)	(1.48)	(1.45)	(0.06)
acqbtmv	0.635	0.553	0.582	0.082
	(0.59)	(0.58)	(0.58)	(0.09)
tarar	0.248	0.202	0.218	0.046
	(0.29)	(0.30)	(0.30)	(0.06)
tarp1bhar	-0.107	-0.103	-0.105	-0.004
	(0.46)	(0.58)	(0.54)	(0.92)
tarp3bhar	-0.224	-0.196	-0.206	-0.028
	(1.57)	(1.47)	(1.50)	(0.82)
tarprv	1.271	1.296	1.288	-0.025
	(0.80)	(0.84)	(0.83)	(0.70)
tarbtmv	0.691	0.672	0.678	0.019
	(0.58)	(0.53)	(0.54)	(0.67)
cong	0.429	0.402	0.411	0.027

	(0.50)	(0.49)	(0.49)	(0.51)
dmkt	0.127	0.175	0.158	-0.048
	(0.16)	(0.16)	(0.16)	(0.00)
ftseper	17.827	17.719	17.756	0.108
	(5.34)	(4.86)	(5.03)	(0.80)
indexyield	0.032	0.033	0.033	-0.001
	(0.01)	(0.01)	(0.01)	(0.14)
lnacqcap	5.738	4.723	5.074	1.015
	(2.04)	(1.97)	(2.05)	(0.00)
logrelsize	-0.962	-0.483	-0.648	-0.479
	(0.76)	(0.63)	(0.71)	(0.00)
longshort	-0.61	-0.276	-0.391	-0.334
	(1.84)	(1.66)	(1.73)	(0.02)
overval	1.641	1.754	1.715	-0.113
	(1.68)	(1.96)	(1.86)	(0.43)

Table 3: Tests for differences in valuation ratios. The Table shows the differences in residual income valuation to price ratios and book to market value ratios, between cash and equity financing acquirers, and between acquirer and target firms. T-tests immediately below the ratios are probabilities from two-tailed tests of the ratio being different from unity. T-tests following the "differences" rows and columns show the probabilities from two-tailed tests (assuming unequal variances) of a test that the difference is zero, and the MW-test following the "differences" rows and columns show the probability from a non-parametric Mann-Whitney test of the difference being zero.

Full	All	Cash	Equity	Difference (Cash vs Equity)	t-test difference	MW Test difference	All	Cash	Equity	Difference (Cash vs Equity)	t-test difference	MW Test difference
	Price to Residual Income Valuation						Book to Market Value					
No. Obs.	669	231	438				669	231	438			
Acquirers	1.704	1.559	1.780	-0.221	0.057	0.013	0.581	0.635	0.553	0.082	0.085	0.166
t-test p	0.000	0.000	0.000				0.000	0.000	0.000			
Targets	1.288	1.271	1.296	-0.026	0.700	0.880	0.678	0.691	0.672	0.019	0.672	0.996
t-test p	0.000	0.000	0.000				0.000	0.000	0.000			
Difference (Acquirer – Target)	0.416	0.288	0.484				-0.097	-0.056	-0.118			
t-test difference	0.000	0.007	0.000				0.002	0.303	0.002			
M-W Test difference	0.000	0.166	0.000				0.000	0.170	0.022			

Table 4: Tests for differences between upper and lower quantile groups. The Table shows the differences in valuation ratios and propensity to issue shares, with quantiles based on the following variables: the acquirer's price to residual income valuation (RIV) ratio (*acqprv*); the target's price to RIV ratio (*tarprv*); and the acquirer's RIV divided by the target's RIV (*overval*). Upper and lower quantiles are set on the basis of the 30th and 70th centiles. The t-tests following the "differences" rows show the probabilities from two-tailed tests (assuming unequal variances) of a test that the difference is zero. Number of observations is 669 acquisitions.

Defining variable	acprv	acprv	tarprv	tarprv	overval	overval	overval
Test variable	tarprv	shares	acqprv	shares	acqprv	tarprv	shares
Lower Quantile	0.924	0.602	1.247	0.642	0.858	1.758	0.577
Upper Quantile	1.657	0.705	2.210	0.655	3.047	0.994	0.660
Difference	0.733	0.103	0.963	0.013	2.189	-0.764	0.083
t-test	0.000	0.030	0.000	0.782	0.000	0.000	0.088

Table 5. BHAR tests of pre-acquisition, announcement and post-bid returns for acquirers and targets. The table shows the buy and hold abnormal returns for each of the following variables: the acquirer's pre-bid BHAR for 1 year (*acqp1bhar*) and 3 years (*acqp3bhar*) pre-acquisition; the target's pre-bid BHAR for 1 year (*tarp1bhar*) and 3 years (*tarp3bhar*) pre-acquisition; the acquirer's announcement month return (*acqar*) and the target's announcement month return (*tarar*); and the acquirer's buy and hold abnormal return (BHAR) for 1 year (*acq1bhar*) and 3 years (*acq3bhar*) post acquisition. The p-values following the BHAR rows show the probabilities from the Lyon et al (1999) bootstrapped skewness adjusted t-test that the BHAR is zero. The p-values in the differences column show the probability from a non-parametric Mann-Whitney test of the difference being zero.

Financing	All	Stock	Cash	Difference: Stock - Cash
No. Obs.	669	438	231	
Pre-bid returns				
acqp1bhar	21.65%	29.63%	6.53%	23.11%
p-value	*0.000*	*0.000*	*0.123*	*0.005*
acqp3bhar	51.33%	66.46%	22.66%	43.80%
p-value	*0.000*	*0.000*	*0.025*	*0.002*
tarp1bhar	-10.46%	-10.32%	-10.73%	0.41%
p-value	*0.002*	*0.031*	*0.004*	*0.415*
tarp3bhar	-20.59%	-19.62%	-22.44%	2.82%
p-value	*0.006*	*0.013*	*0.381*	*0.205*
Announcement Period Returns				
acqar	-0.58%	-0.94%	0.12%	-1.06%
p-value	*0.215*	*0.128*	*0.856*	*0.157*
tarar	21.80%	20.24%	24.76%	-4.52%
p-value	*0.000*	*0.000*	*0.000*	*0.025*
Post bid Returns				
acq1bhar	-6.84%	-8.21%	-4.24%	-3.96%
p-value	*0.000*	*0.000*	*0.125*	*0.291*
acq3bhar	-15.41%	-20.18%	-6.37%	-13.82%
p-value	*0.000*	*0.001*	*0.233*	*0.005*

Table 6. BHAR tests of post-acquisition returns for acquirers and targets for equity financing acquirers by relative over-valuation. The table the buy and hold abnormal returns for each of the following variables: the acquirer's announcement month return (*acqar*); the acquirer's buy and hold abnormal return (BHAR) for 1 year (*acq1bhar*) and 3 years (*acq3bhar*) post acquisition; and the target's announcement month return (*tarar*). The "Over by >x%" columns show the results where acquirers are relatively over-valued compared to the targets. The "Under by >x%" columns show cases where the acquirers are relatively under-valued compared to targets. The first three columns show the results for the sample of acquisitions and mergers where over / under valuation is defined by a simple partition; the following three show the results for the sample of acquisitions for which acquirers are relatively over valued by >10% or relatively under-valued by >10%; and the final three show the results for the sample of acquisitions for which acquirers are relatively over valued by >20% or relatively under-valued by >20%. The p-values following the BHAR rows show the probabilities from the Lyon et al (1999) bootstrapped skewness adjusted t-test that the BHAR is zero. The p-values in the differences column show the probability from a non-parametric Mann-Whitney test of the difference being zero.

Acquirer relatively over-valued or under-valued by:	Over by >0%	Under by >0%	Difference	Over by >10%	Under by >10%	Difference	Over by >20%	Under by >20%	Difference
Number of Observations	261	177	438	236	149	385	222	114	336
acqar	-0.94%	-0.95%	0.01%	-1.23%	-0.75%	-0.48%	-1.43%	0.14%	-1.57%
p-value	*0.287*	*0.327*	*0.863*	*0.183*	*0.475*	*0.699*	*0.132*	*0.891*	*0.571*
acq1bhar	-6.30%	-11.03%	4.73%	-5.34%	-11.69%	6.35%	-4.08%	-10.41%	6.33%
p-value	*0.032*	*0.000*	*0.306*	*0.059*	*0.000*	*0.131*	*0.171*	*0.011*	*0.280*
acq3bhar	-18.22%	-23.08%	4.86%	-20.90%	-21.43%	0.53%	-19.80%	-23.31%	3.51%
p-value	*0.036*	*0.001*	*0.695*	*0.037*	*0.008*	*0.902*	*0.061*	*0.023*	*0.886*
tarar	24.62%	13.78%	10.83%	25.69%	14.18%	11.51%	26.09%	15.37%	10.72%
p-value	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*

Table 7: Logistic regression tests based upon valuation ratios. This Table reports the results of logistic regressions with dependent variable "Shares", a dummy variable equal to one if the acquisition is financed by equity, zero if the acquisition is for cash. Independent variables are: the 12-month pre-bid return on the FTASI (*dmkt*); the difference between long gilt yields and the Treasury Bill rate (*longshort*); the natural logarithm of the market value of the target to the market value of the acquirer (*logrelsize*); the acquirer's price to residual income valuation (RIV) ratio (*acqprv*); the target's price to RIV ratio (*tarprv*); a dummy variable (*reloverval*) equal to one if the acquirer's RIV to market value ratio is greater than that of the target; the acquirer's book to market value (*acqbtmv*); the target's book to market value (*tarbtmv*); and the intercept term (*_cons*). In addition, valuation ratios for acquirer and target (*acqvalgp* and *tarvalgp* respectively) and overvaluation (*overvalgp*) are defined on the basis of groups (see Table 5) where upper and lower quantiles are set on the basis of the 30th and 70th centiles. N=669.

Variable	**Coefficient (p-value)**				
dmkt	2.31	2.304	2.4	2.429	2.321
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
longshort	0.194	0.188	0.19	0.187	0.193
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
logrelsize	1.168	1.166	1.178	1.161	1.182
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqprv	0.148				
	(0.029)				
tarprv	-0.075				
	(0.507)				
acqvalgp		0.282			
		(0.023)			
tarvalgp		-0.125			
		(0.311)			
reloverval			0.459		
			(0.011)		
overvalgp				0.252	
				(0.029)	
acqbtmv					-0.347
					(0.022)
tarbtmv					-0.025
					(0.883)
_cons	1.06	0.899	0.945	0.686	1.443
	(0.000)	(0.003)	(0.000)	(0.010)	(0.000)
Pseudo R2	0.124	0.124	0.125	0.123	0.124
LR Chi2 and P-value	-377.911	-377.744	-377.17	-378.01	-377.605
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 8. Maximum likelihood treatment effects model of financing choice, with regression dependent variable the acquiring firm's 36-month BHAR.
The first panel shows the results from the treatment model augmented regression from Maddala (1983) with the additional panels showing the first stage probit results from this process, together with the hazard or selectivity correction. Estimation is conducted using the 2-stage estimator in Stata. Independent variables in the second stage augmented regression are: the natural logarithm of the acquirer's market capitalisation (*lnacqcap*); the target's announcement month return (*tarar*); the PE ratio on the FTASI (*ftseper*); a dummy variable (*cong*) equal to one if the acquisition is cross-industry, zero otherwise; a dummy variable equal to one if the acquisition is financed by equity (*shares*): the yield on long-dated index-linked gilts (*indexyield*); and *_cons*, the intercept term. Independent variables in the first stage probit are: the 12-month pre-bid return on the FTASI (*dmkt*); the difference between long gilt yields and the Treasury Bill rate (*longshort*); the natural logarithm of the market value of the target to the market value of the acquirer (*logrelsize*); the acquirer's price to residual income valuation (RIV) ratio (*acqprv*); the target's price to RIV ratio (*tarprv*); a dummy variable (*reloverval*) equal to one if the acquirer's RIV to market value ratio is greater than that of the target; the acquirer's book to market value (*acqbtmv*); the target's book to market value (*tarbtmv*); and the intercept term (*_cons*). In addition, valuation ratios for acquirer and target (*acqvalgp* and *tarvalgp* respectively) and overvaluation (*overvalgp*) are defined on the basis of groups (see Table 5) where upper and lower quantiles are set on the basis of the 30th and 70th centiles. N=669.

Variable	Coefficient (p-value)			
Treatment model augmented regression				
lnacqcap	0.041	0.040	0.039	0.039
	(0.017)	(0.022)	(0.031)	(0.023)
tarar	-0.147	-0.149	-0.151	-0.150
	(0.129)	(0.119)	(0.113)	(0.117)
ftseper	0.019	0.019	0.019	0.019
	(0.029)	(0.026)	(0.028)	(0.027)
cong	-0.051	-0.052	-0.052	-0.052
	(0.416)	(0.413)	(0.413)	(0.414)
indexlkyield	5.430	5.620	5.741	5.631
	(0.327)	(0.314)	(0.309)	(0.314)
shares	-0.048	-0.083	-0.103	-0.084
	(0.819)	(0.693)	(0.672)	(0.697)
_cons	-0.789	-0.771	-0.761	-0.770
	(0.020)	(0.022)	(0.025)	(0.022)
First stage probit regression				
dmkt	1.345	1.332	1.379	1.408
	(0.000)	(0.000)	(0.000)	(0.000)
longshort	0.115	0.111	0.113	0.112
	(0.000)	(0.000)	(0.000)	(0.000)
logrelsize	0.694	0.693	0.701	0.693
	(0.000)	(0.000)	(0.000)	(0.000)
acqprv	0.089			
	(0.034)			

tarprv	-0.050			
	(0.468)			
acqvalgp		0.165		
		(0.028)		
tarvalgp		-0.077		
		(0.303)		
reloverval			0.277	
			(0.010)	
overvalgp				0.156
				(0.024)
_cons	0.642	0.553	0.571	0.406
	(0.000)	(0.002)	(0.000)	(0.013)
Selectivity correction				
lambda	-0.043	-0.019	-0.005	-0.018
Wald test of indep. eqns. (rho = 0)	0.100	0.020	0.000	0.020
	(0.746)	(0.885)	(0.969)	(0.892)
Wald chi2 test for sig. of augmented regression	23.070	23.250	23.060	23.140
	(0.001)	(0.001)	(0.001)	(0.001)